

## ABSTRACT OF THE DISCLOSURE

This invention discloses improvements on previous inventions for catalytic conversion of coal and steam to methane. The disclosed improvements permit conversion of petroleum residua or heavy crude petroleum to methane and carbon dioxide such that nearly all of the heating value of the converted hydrocarbons is recovered as heating value of the product methane. The liquid feed is distributed over a fluidized solid particulate catalyst containing alkali metal and carbon as petroleum coke at elevated temperature and pressure from the lower stage and transported to the upper stage of a two-stage reactor. Particulate solids containing carbon and alkali metal are circulated between the two stages. Superheated steam and recycled hydrogen and carbon monoxide are fed to the lower stage, fluidizing the particulate solids and gasifying some of the carbon. The gas phase from the lower stage passes through the upper stage, completing the reaction of the gas phase.

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